GLAST Observatory Status

SWG February '03

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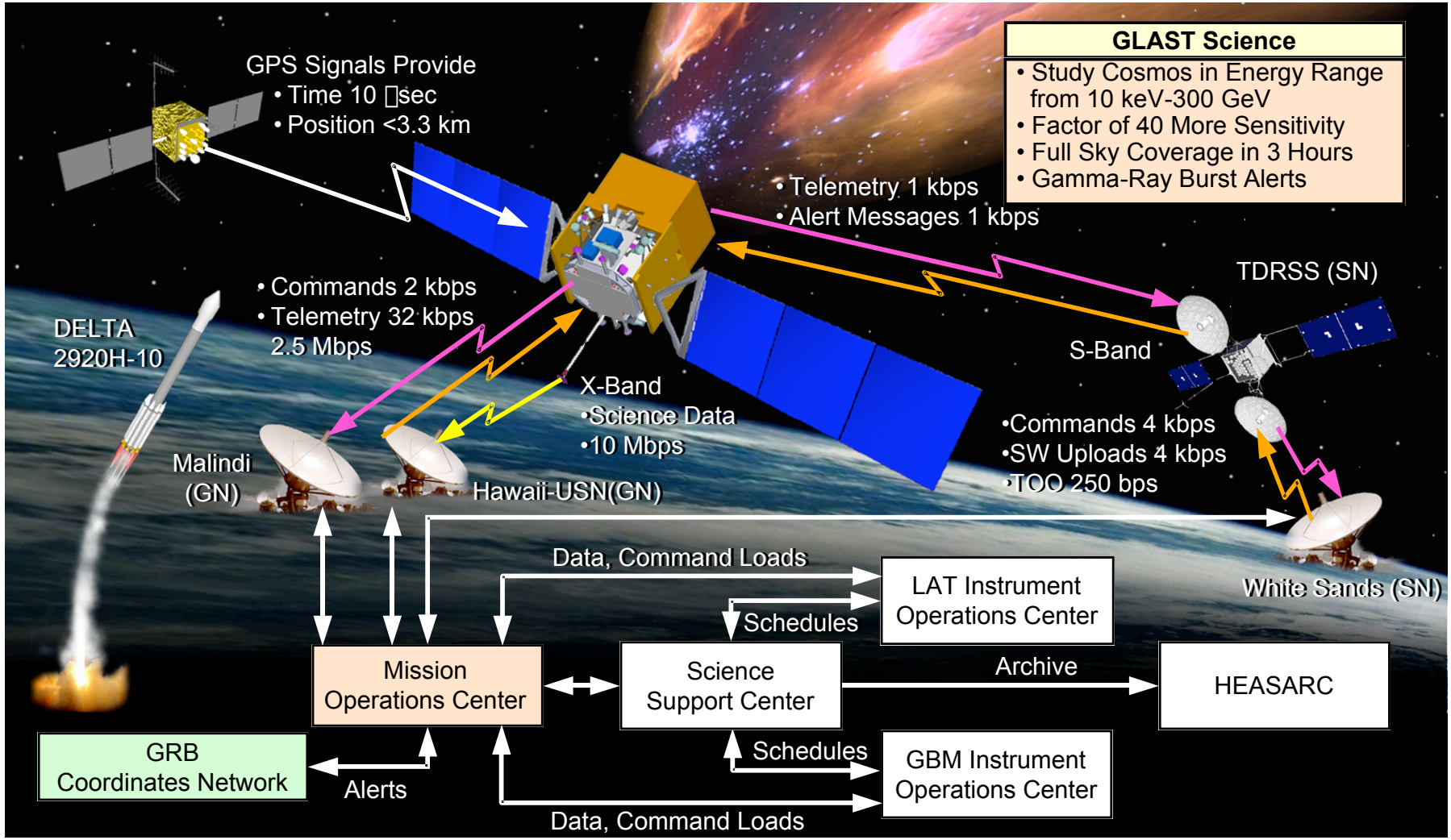
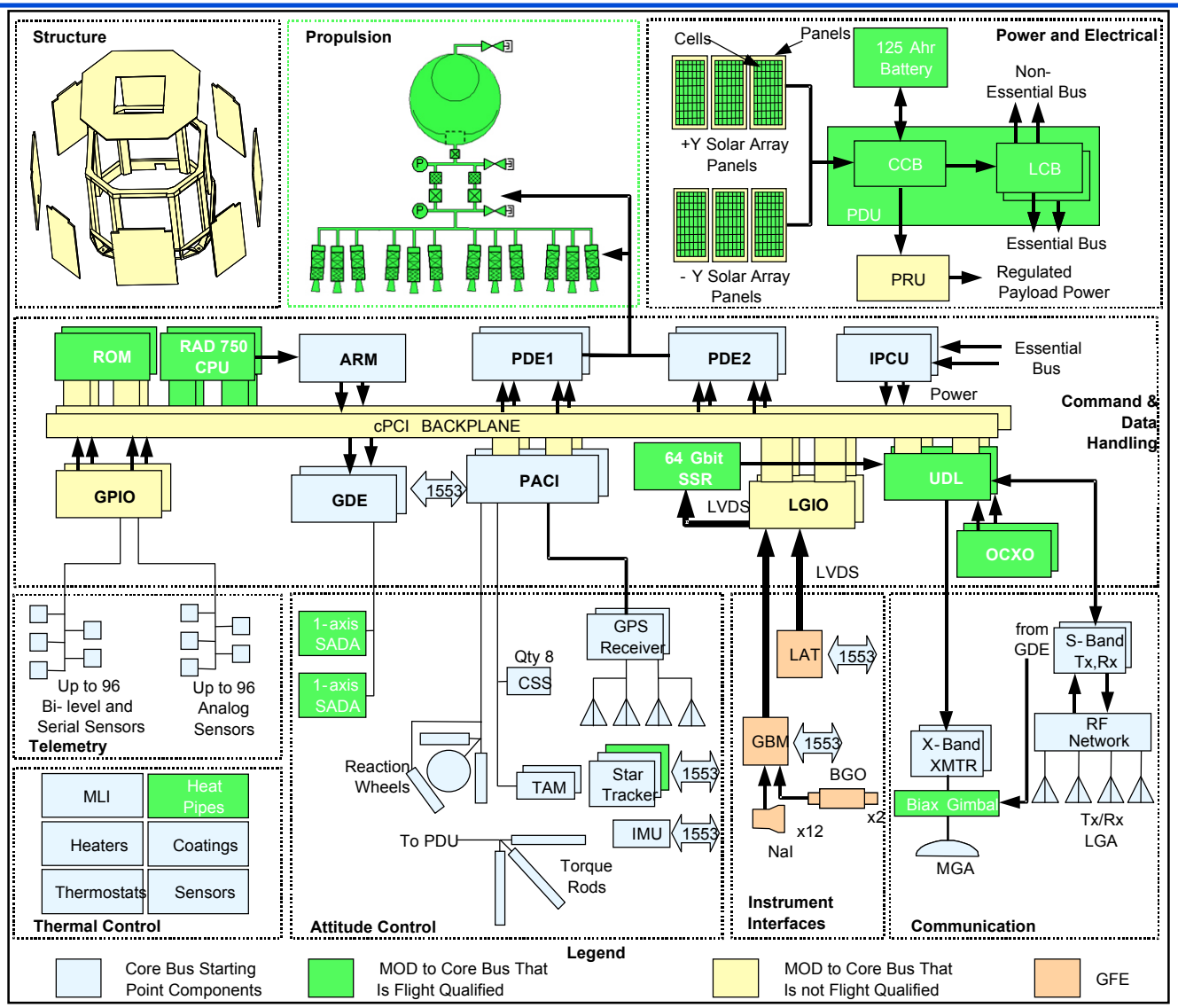
GLAST Mission Overview



SPACECRAFT BLOCK DIAGRAM



SRD Table 3 (1 of 3)

☐	*Quantity*	*GLAST Requirement 1*	*GLAST Goal 1*	*GLAST Minimum 1*	*Current Performance Estimate*
28	**Mission Lifetime** (<20% degradation) 2	> 5 years	> 10 years	> 3 years	Spacecraft P_s= .907 (@ 5 yrs)
29	**Telemetry Downlink Orbit Average**	> 300 kbps	> 1 Mbps	> 300 kbps	Observatory and ground system designed to handle twice requirement. Limited by number of downlinks.
30	**Telemetry Downlink Realtime** 3	> 1 kbps	> 2 kbps	> 0.5 kbps	32 kbps thru GN, 1kbps thru TDRSS
31	**Telemetry Uplink Realtime** 3	> 1 kbps	> 2 kbps	> 0.5 kbps	2 kbps thru GN, 4 kbps thru TDRSS
32	**Time to Respond to TOO's on Ground** 4	< 6 hours	< 4 hours	< 12 hours	Comply

SRD Table 3 (2 of 3)

33	**Spacecraft Repointing Times for Autonomous Slews** 5	< 10 min	< 5 min	NA	4.9 min for 75 deg slew with 4 reaction wheels
34	**GRB Notification Time to Ground by Spacecraft** 6	< 7 sec	< 4 sec	< 10 sec	Allocation: 1 sec for spacecraft, 5 sec for Space-Ground network, 1 sec for GN
35	**Pointing Accuracy Absolute 7**	< 2°	< 0.5°	< 5°	0.32 deg for 3-axes control
36	**Pointing Knowledge 7**	< 10 arcsec	< 5 arcsec	< 20 arcsec	Allocation: Spacecraft 6 arc-sec - analytic performance pre-PDR is 2.9
37	**Observing Modes**	- Rocking zenith pointing - Pointed mode 8	□	□	Spacecraft operating modes comply
38	**Targeting**	No restrictions on pointing of axis normal to LAT	□	□	Comply; Spectrum X-band antenna allows un-interrupted science during downlinks
39	**Uniformity of Sky Coverage during Scanning** 9	< ± 20%	< ± 10%	< ± 30%	Comply

SRD Table 3 (3 of 3)

40	**Observatory Absolute Time Accuracy** 10	< 10 μsec	< 3 μsec	< 30 μsec	0.5 μsec
41	**Observatory Absolute Position Accuracy**	< 3.3 km	< 1 km	< 10 km	1 km from on-board GPS receivers
42	**Observing Efficiency** 11	> 90 %	> 95%	> 80%	Comply
43	**Data Loss** 12	< 2 %	< 1%	< 5%	Comply
44	**Data Corruption** 13	$< 10^{-10}$	$< 3 \times 10^{-11}$	$< 3 \times 10^{-10}$	Comply

NOTES from SRD Table 3

1 Requirement = value to design to; Goal = value to strive for to enhance science; Minimum = value that if not satisfied triggers a Project review.

2 20% degradation = no more than 20% loss of LAT science return.

3 Uplink telemetry rate for at least 80% of time outside of SAA.

4 Response time for the MOC to uplink a spacecraft repointing after the decision is made to respond to a Target of Opportunity (TOO).

5 Time for 75^0 slew.

6 Time from spacecraft receipt of GRB notification from GBM or LAT to delivery to the Gamma-ray Coordinates Network (GCN) computer for 80% of all GRBs detected by the GBM or LAT.

7 1 sigma radius.

8 Pointing of axis normal to LAT to within 30^0 of source. (No science constraint on roll axis.).

9 Sky coverage exposure uniformity integrating for 7 days, not including SAA effects.

10 Relative to Universal Time, 1 sigma r.m.s..

11 Fraction of time with data return, not including SAA effects.

12 Fraction of data taken by the instruments but not delivered to the IOC. Not including SAA data loss. Not including instrument deadtime.

13 Fraction of undetected corrupted events.

Progress on Instrument to Spacecraft Interfaces

LAT

- **Power feed**
  - SIU, DAQ, and VCHP reservoir heater feeds regulated (28±1 Vdc)
  - Grid and VCHP antifreeze heater feeds unregulated (25 to 35 Vdc)
- **LVDS for science data, 1 PPS, burst alert signal from GBM, and discrete command signals**
- **Mechanical interface will be at the four stiffening wings which have been added to the bottom of the grid**
- **Solar array thermal properties have been communicated to SLAC/Lockheed for incorporation in radiator heater design**

GBM

- **Reorientation of NaI detectors as requested by MSFC**
- **Unregulated power feed (25 to 35 Vdc)**
- **LVDS for 1 PPS and burst alert signal to LAT**
- **Alignment references to be provided on detectors**
- **DPU is cross strapped to S/C C&DH for science data, timing, and 1553**

Both

- **1 PPS drift less than 1 _s over 100 s in event of GPS outage**
- **Single SSR partition for interleaved LAT and GBM science data**
- **1553 bus protocol**

Open Areas on Instrument to Spacecraft Interfaces

LAT

- Spacecraft current and voltage monitors on LAT power feeds
- Mechanical interface details and alignment references

GBM

- Detector radiator orientations
- Conditioning of GBM power box voltage monitors

Both

- Harnessing and electrical connector details
- Spacecraft response to instrument monitors

ICDs development is on schedule for 4/25/03 baselining

Project Activities

Since the last SWG….

- Mission Ops Center @ GSFC with Swift-like development by Omitron
- Engineering emphasis on Spacecraft/Instrument Interfaces; ICD development on schedule for PDR baselining
- Received approval for 20 MHz bandwidth utilization for X-band science downlink
- Requirements developed with Spectrum to enhance redundancy of Spacecraft bus; Spectrum developing preliminary design details with Proposal to be submitted by March 1
- Increased Solid State Recorder size from 64 to 96 Gbits
- Baselined Project Master Schedule integrating Spacecraft, LAT, & GBM

Project Activities

Issues

- ASI Funding for Malindi Ground Station
- Finalization of Spacecraft architecture

Just Ahead……a challenging Spring ’03 schedule

- Spacecraft PDR – April 8-11
- LAT CDR – April 29-May 2
- Mission PDR – Late May